Storage Tiers

Storage History

- Previously one tier of storage, defined as Tier 1, available at the Commonwealth Enterprise Solutions Center (CESC)
  - One storage resource unit (RU) included:
    - Backup
    - Refresh
    - Maintenance
    - Service level agreement (SLA) performance
- New amendment recognized the enterprise need for multiple tiers or platforms of storage to support enterprise operations

Tier	Billing Unit	Storage Type	Backup (Y/N)	Replication Supported (Y/N)	Location
Storage Tier 1 at CESC	Gigabyte (Allocated Space)	High Availability NAS or SAN	Y	Y	CESC/SWESC
Storage Tier 2 at CESC	Gigabyte (Allocated Space)	Standard Availability NAS or SAN	Y	N	CESC/SWESC
Storage Tier 2 at CESC	Gigabyte (Allocated Space)	Standard Availability NAS or SAN	N	N	CESC/SWESC
Storage Tier 2 outside of CESC	Gigabyte (Allocated Space)	Standard Availability NAS or SAN	Y	N	Customer Site
Storage DASD (Direct Access Storage Device)	Gigabyte (Raw Space)	Physically Attached Storage (Internal or External)	Y	N	Any
Storage DASD	Gigabyte (Raw Space)	Physically Attached Storage (Internal or External)	N	N	Any

- Tier 1 -- highly available, high-performance storage
  - Performance
    - Internal Operations Per Second (IOPS) counts in excess of 15,000
    - Storage attached network (SAN) fabric redundancy, component level redundancy within the storage array
    - Remote administration – automation in place
    - Provisioning changes are transparent
    - Array caching algorithms provide high-cache hit rate for host read/write
    - Streamlined provisioning for faster storage allocation response times
  - Allocate, grow and reclaim storage efficiently
  - Only at CESC (three-tier facility)
  - Data replicated to Southwest Enterprise Solutions Center (SWESC)
    - Array-based replication with SWESC requires no host involvement
  - Tier 1 allocation:
    - SAN high availability storage allocated to the server (i.e. useable space allocated)
    - Backup is provided

- Tier 2 is highly available scalable performance storage
  - Performance
    - IOPS approaching Tier 1 are possible
    - SAN fabric redundancy and component level redundancy within the storage array
    - Remote administration – automation in place
    - Provisioning changes are transparent
    - Streamlined provisioning for faster storage allocation response times
    - Array caching algorithms provide high cache hit rate for host read/writes
  - Allocate, grow and reclaim storage efficiently
  - Located at CESC/SWESC and agency locations
  - Tier 2 allocation
    - Network attached storage (NAS)/SAN standard availability storage allocated to server (i.e. useable space)
    - Standard backup/no backup options available at CESC/SWESC
    - Standard backup included at non-CESC/SWESC locations

- Direct attached storage (DASD) is internal or external
  - Details
    - Performance determined by attachment type, SCSI, SAS, internal disk, etc.
    - Redundancy not always possible
    - No remote automation or limited
    - Provisioning changes may require downtime and manual effort
  - DASD allocation
    - Raw storage installed to a server
    - Standard backup/no backup options available at CESC/SWESC
    - Backup options are available at non-CESC/SWESC locations

- Backup
  - Standard backup process
    - Daily incremental backup (kept offsite for 35 days)
    - Weekly full backup (kept offsite for 35 days)
    - Monthly full backup (retained for 12 months)
  - Customization and options are available
    - A work request will be required
  - Avamar product available for remote locations and daily backup capability

Moving Data to Tiered Structure Technical Highlights

- Problem Statement
  - During transformation multiple storage frames and units were moved to CESC
  - Original agreement called for Tier 1 storage, Amendment 60 established tiers

Moving Data to Tiered Structure Technical Highlights

- Solution
  - Collapse multiple storage frames supporting multiple customers in CESC and SWESC data centers only
  - ~ 75 TB Tier 1 in CESC replicated to SWESC for DR
  - ~ 380 TB of Tier 2 storage required in CESC
  - ~ 42 TB of storage for IBM and mainframe systems replicated between CESC and SWESC
  - Support for existing 166 TB of Exchange 2003 data 83 in CESC and 83 replicated to SWESC for DR

Moving Data to Tiered Structure Technical Highlights -- Continued

- ~275 TB of storage for Exchange 2010 of which ~186 is in CESC and 93 is in SWESC for DR
- Reporting for Tier 1 and 2 storage for all assigned agencies by host by usage for billing/reporting
- Integration into Symantec and Avamar backup solutions
- Snap technology and clone technology to be incorporated

Moving Data to Tiered Structure Action Plan

- August
  - Commence infrastructure review; set up new hardware; create target environments
  - Meet with Tier 1 server customers and detail plans on migration and time frames
- September
  - Target Tier 1 customers moving to new Tier 1 equipment
    - Virtual machines (VM) move without outages
    - Physical servers switched over during Sunday maintenance window
  - Meet with Tier 1 to Tier 2 customers and detail plans on migration and timeframes
- October
  - Continue with migrations

Managing Storage

- Consider what is consuming storage; delete or move to lower tier
  - Consider percentages by file type, e.g., jpeg, mp3, database or Office documents
  - Duplicates files -- How much space is consumed by the same file and e-mail attachments sent to numerous individuals saved to local disk?
  - Large files -- How much space is consumed by freeware applications from the Internet, versions and backups created by multiple users?
  - Files that are archived – How long since the file was accessed?
  - Identify application trends for better capacity planning. For example, how fast is my database growing?
  - Determine input/output performance requirements

Managing Storage

- Tools for determination
- User tools
  - Command line utilities, e.g., “find,” “du – k,” “df –k,” etc., for UNIX. Windows explore utilities and Windows search utilities.
  - Free downloadable tools that will produce lists of files by type, date, owner, etc. (examples: UltraSearch or FileList)
- IT partnership tools (may require work request; some tools available after storage consolidation)
  - EMC Storage Scope + SRM (Storage Resource Management)
  - EMC Control Center
- Storage mitigation strategies
  - Create business policies for user storage utilization, e.g., quotas, limitation on personal files, identify storage for non-essential data, etc.
  - Review monthly storage utilization rates

Managing Storage

- Storage Service Requests
  - Request may require a work request via the VITA Customer Care Center (VCCC or help desk)
  - Anticipate new form for storage space provisioning/de-provisioning
    - Accurately record requests and changes to storage environment
    - Request new storage
    - Request additional storage
    - Reduce amount of currently allocated storage
- Customer Actions
  - How to remove files
    - Based upon review of generated file lists, customers delete unneeded files following agency change control practices

Managing Storage – Next Steps

- Share information
  - Meetings and webinars being developed to share technical information, guidance and practical how-to information on storage management with agency teams
- New Service Offerings
  - Examining new service offerings
    - To address archiving
    - To identify and manage data

FAQs

– Answers to questions posed to AOMs or CSLs will be posted regularly on the AITR section of the VITA website.